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## Clarity of roles and responsibilities in interagency information sharing (IIS) projects: determinants and impact on success

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**Abstract:** Interagency information sharing (IIS) is a complex endeavour in which various participants must cross the boundaries of their respective agencies and work collaboratively. Achieving success in such an undertaking can benefit from clarity of roles and responsibilities within the collaboration. Based on a national survey distributed to public managers and other actors involved in IIS in public health and criminal justice in the USA, this study aims to evaluate the influence of six determinants of clarity of roles and responsibilities on the success of an IIS project. Our findings indicate the significant roles of (a) the use of boundary objects, (b) communication skills, (c) the diversity of participating organisations, (d) respect for autonomy, and

(e) the exercise of formal authority to the development of clarity of roles and responsibilities and the likelihood of attaining IIS project success. However, the influence of these predictors on the achievement of success depends largely on how success is defined and measured.

**Keywords:** clarity of roles and responsibilities; role ambiguity; IIS; interagency information sharing; boundary objects; e-government.

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## 1 Introduction

Information integration and sharing, supported by advanced information and communication technologies (ICTs), facilitates the collective capabilities of agencies, private entities, and the general public to organise, interact, and govern to overcome increasingly complex social challenges (Johnston and Hansen, 2011). The capability to

integrate and share information forms the foundation of government efforts to develop and execute public policies that are smart, efficient, and more responsive to contemporary social problems (Scholl and Scholl, 2014).

Information integration and sharing often involves participants across policy domains and requires that individuals, units, and organisations work across the boundaries of various domains (Dawes, 1996). The number of participating organisations and individuals involved in such efforts increases the complexity of work across multiple organisations (Atkinson et al., 2001). Hence, collaborative activities are a crucial component of information integration and sharing projects (Dawes, 1996; Dawes et al., 2009).

For government officials who were unaccustomed to working collaboratively across their respective agency's boundary, information integration and sharing projects can be challenging (Dawes, 1996). The agency's cultures, division of labour, and specialisation challenge the efforts of each participant to share and collaborate in information integration and sharing initiatives (Pardo and Burke, 2008). As government officials are more accustomed to the 'need to know' than the 'need to share' culture (Dawes et al., 2009), the professional identities and agency culture that isolate practice domains and knowledge resources potentially obstruct the creation of trust in an information integration and sharing project (Pardo and Burke, 2008).

Clarity of roles and responsibilities (CRRs) in an information integration and sharing project can help build trust among members (Pardo et al., 2009). CRRs precipitate the formation of mutual expectations and a clear understanding of what is expected from the participants in the collaborative efforts (Thomson and Perry, 2006; Vangen and Huxham, 2003). A shared understanding of the role expectations will increase the perception of individuals that they have salient information to effectively enact their roles in the collaboration, hence reducing role ambiguity (Singh, 1993) and increase work satisfactions (Hassan, 2013). Specifying and facilitating agreement on roles and responsibilities of participants is part of network management, known as framing, which represents the crucial first steps taken by the network manager to invigorate the collaboration (McGuire, 2002).

Studies in marketing and organisational psychology have undertaken rich and expansive scholarship on role clarity or role ambiguity by focusing on the individual level, a single organisation, or inter-organisational relationships (Singh, 1993). This paper enriches that discussion by providing a systematic assessment of the determinants and impact of CRRs in a less clearly understood area of information integration and sharing: collaboration across multiple jurisdictions and levels of government. Moreover, this paper contributes to evaluating the impact of CRRs on the success of information integration and sharing projects that involve various government agencies. As such, this paper addresses two research questions as follows:

- What are the determinants of CRRs in an information integration and sharing project
- Do the determinants of CRRs affect the success of information integration and sharing projects?

This study analysed data collected from a national survey evaluating interagency information sharing (IIS) in the USA, using ordinary least square to test the hypotheses. An information integration and sharing project, as defined in this paper, refers to initiatives that develop information sharing or communication capabilities that involve

two or more government agencies (abbreviated as IIS hereafter). The survey was distributed to public managers and other actors involved in public health and criminal justice information integration initiatives at the state and local level in the USA. The public health cases focused on local and state government responses to West Nile virus outbreaks in Colorado, Oregon, Connecticut, and New York. The criminal justice cases included inter-agency information integration initiatives at the state level in New York, North Carolina, and Colorado, and at the local level in New York City. The determinants of CRRs in this study were identified from literature in management information systems, information science, political science, public administration, and organisational sociology. We adopted three specific determinants of CRRs from the study by Pardo et al. (2009).

This paper is organised in five sections, including the foregoing introduction. Section 2 highlights studies that evaluate the influence of CRRs to organisational and IIS performance. Section 2 also describes the hypotheses and the preliminary model. We describe our research methodology in Section 3, including the data distribution, variable measurement, and analysis technique. Section 4 discusses the findings and results from the statistical analysis. Finally, we present our discussion and concluding remarks in Section 5.

## **2 Literature review**

### *2.1 Determinants of clarity of roles and responsibilities and IIS success*

Role clarity, or its inverse, role ambiguity, has been extensively studied in a variety of organisational contexts (see for instance, Bedeian and Armenakis, 1981; Jackson and Schuler, 1985; Sawyer, 1992; Whitaker et al., 2007). Role clarity and ambiguity can be defined as “the presence [or absence] of adequate role-relevant information due either to restriction of this information or to variations of the quality of the information ... [or] the subjective feeling of having as much [or not as much] role-relevant information as the person would like to have” (Lyons, 1971, p.100). Clarity of roles emerges when a person has adequate information to enact his or her role, while role ambiguity occurs when a person is not aware of the expectations associated with their role (Kahn et al., 1964) or from poor communication practices (Schaubroeck et al., 1993). Studies argue that role ambiguity has a negative effect on performance, while CRRs have a positive impact on performance (Doherty and Hoyer, 2011), including organisational performance (Rainey, 1983; Chun and Rainey, 2005) or system development (Pratt et al., 2016).

CRRs are an important factor in an inter-organisational setting where several organisations or agencies must interact with each other. In that situation, ambiguity regarding roles and responsibilities hinders collaboration (Sloper, 2004; Meyer and Mazerolle, 2014), hampers effective communication in collaborative efforts (Dickerson et al., 2012; Hocevar et al., 2006), and could undermine the effectiveness of management operations (Lee, 2016). On the contrary, CRRs positively affects the success of collaboration in multi-agency settings such as in an IIS project (Pardo et al., 2009). Having a clear sense of what should be done to achieve common goals in a collaborative effort increases work satisfaction (Hassan, 2013) and gives the participants ideas about what they need to do and what they can expect from other participants (Thomson and Perry, 2006).

CRRs enable the development of other important determinants of success in inter-organisational information sharing, such as building trust among the participants (Pardo et al., 2006). To illustrate the importance of CRRs, we can focus on the individuals who are assigned to participate in a collaborative IIS project. The individuals assigned to participate in an inter-organisational project are often regarded as ‘people at the boundary’ (Akkerman and Bakker, 2011, p.139) because they need to cross their organisation’s boundary to interact with others. More often than not, these individuals are not sure about their roles in the collaboration process, which then likely leads to conflicts (Williams et al., 2007). When individuals are accustomed to working within their respective organisation’s boundary, but then have to traverse that border and interact with other boundaries, they can often feel that they “sort of belong and sort of don’t” in that intermediary space (Tanggaard, 2007, p.460). As a result, these individuals experience an intrinsic tension between their self-interest and the collective interest of an initiative (Thomson and Perry, 2006), which makes them susceptible to conflict. For this reason, the presence of CRRs alleviates the burden for the ‘people at the boundary’ by facilitating the development of trust to help them interact effectively with one another.

Despite the crucial role of CRRs for organisational performance (Chun and Rainey, 2005), questions still remain regarding the determinants of its emergence, particularly in interagency information sharing (IIS) projects. An initial proposition from Pardo et al. (2009) suggests three determinants of CRRs in an IIS project. These determinants are:

- past experiences
- diversity of participating organisations
- exercise of formal authority.

Past experiences indicate participant expectations about the collaboration processes; it is assumed that more experience working collaboratively correlates with higher expectations for smooth collaboration processes (Jonker and Nijhof, 2006). Greater diversity poses the potential for greater conflict, but sensitivity to the different interests of the participating organisations can help the project leaders to delineate roles and responsibilities that minimise these potential conflicts (Pardo et al., 2009). Acknowledging and acting on the differences among the participants facilitate the creation of CRRs in an IIS project. There are a wide range and distribution of power and authority relationships in interagency collaboration due to the diversity of the agencies involved; no single agency has the authority to mandate the roles and responsibilities of other agencies involved in the collaboration. Hence, a judicious process for how to exercise formal authority is necessary to ensure efficient collaboration (Pardo et al., 2009).

Studies identify other determinants of CRRs in addition to the three determinants Pardo et al. (2009) propose in their work. Research has identified the crucial role of the use of boundary objects (Kegerise, 1999; Nidumolu, 1995; Wakerman and Mitchell, 2005). A boundary object is used to alleviate tension and conflicts among diverse participants in IIS collaboration. For instance, the use of GIS mapping as a boundary object improve the collaboration among the different networks of responders in the WTC response efforts (Harrison et al., 2007; Dawes et al., 2004). An IIS project obliges various participants to cross the boundary of their own respective agency and collaborate with one another. Boundary objects are necessary to establish and maintain clear roles and responsibilities (Kegerise, 1999) and to generate shared understandings and

commonalities (Thomson and Perry, 2006), which are crucial to the success of inter-organisational information system (Nidumolu, 1995).

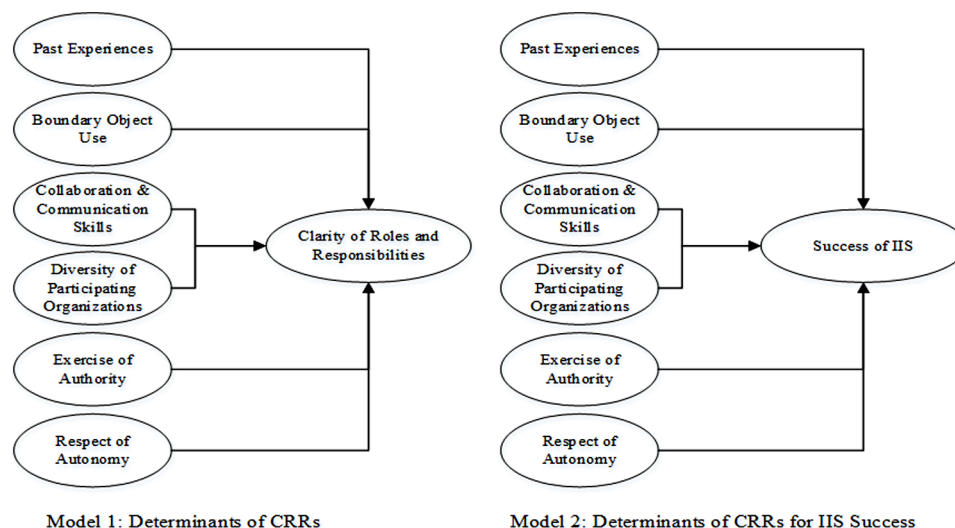
The degree of respect for the autonomy of participating organisations is also a significant determinant for the development of CRRs (Thomson and Perry, 2006). As argued by Pandey and Wright (2006), political influence and environment affect organisational ambiguity which in turn contribute to role ambiguity. Fear of losing agency identity and autonomy create a major barrier for interagency cooperation (Halpert, 1982; Hoban, 1987). The participating agencies will strive to protect their interests to maintain their identity (Hoban, 1987). For that reason, respect for the autonomy of the participating agencies induces a willingness to cooperate because it allows each respective agency to maintain its identity by accentuating clear roles and responsibilities for each agency in collaborative endeavours (Pardo et al., 2009).

Finally, collaboration, coordination, and communication skills are at the heart of any collaborative effort, particularly to facilitate the development of CRRs (Buono, 1997; Casey, 2008; Hardy et al., 2005; Luna-Reyes et al., 2008; Rogers and Molnar, 1976). Communication and collaboration skills are crucial because learning each other's objectives, roles, and constraints are the starting point for an inter-organisational initiative (Luna-Reyes et al., 2008). Poor communication contributes to increase in role ambiguity among staff members (Rizzo et al., 1970; Hassan, 2013). Clarification and agreement upon roles and responsibilities occur via intensive conversations among the participants in collaboration (Hardy et al., 2005). Subsequently, the agreed upon roles and responsibilities must be widely communicated and coordinated to avoid ensuing ambiguity (Casey, 2008).

Following the above-mentioned review of the literature, we proposed two models:

- 1 testing the determinants of CRRs
- 2 connecting the determinants of CRRs to the success of IIS projects (Figure 1).

**Figure 1** Preliminary model



## 2.2 Hypotheses

Although our model depicts the possible endogenous-exogenous relationship between these determinants and IIS success, with CRRs as the mediating variable, we tested the relationship independently. The two independent models are as follows:

- 1 a model to test the determinants to the production of CRRs
- 2 a model to test the influence of the determinants to predict the success of an IIS project.

For this reason, we propose two independent hypotheses.

*H<sub>1</sub>: Boundary object use, past experiences, collaboration and communication skills, diversity of participating organisations, the exercise of formal authority, and respect of autonomy significantly influence the degree of clarity of roles and responsibilities.*

*H<sub>2</sub>: Boundary object use, past experiences, collaboration and communication skills, diversity of participating organisations, the exercise of formal authority, and respect of autonomy significantly influence the success of an IIS project.*

## 3 Research design and methods

We conducted multivariate regression analysis with robust standard errors to account for the possible heterogeneity issue for the data analysis. We first ran the regression to test the influence of the determinants to the CRRs. Subsequently, we tested the influence of the same determinants to the success of IIS initiatives. Prior to the regression analysis, sub-variables were summarised using principal component analysis to create the composite variables. The reliability of the resulting variables was examined using Cronbach's alpha values (Table 2). As mentioned previously, all the Cronbach's alpha values were above 0.70, representing acceptable levels of reliability (Lubke and Muthén, 2004).

### 3.1 Data and data collection

This study analyses data from a national survey conducted by the Center for Technology in Government (CTG) in April 2008. The use of older data should not pose a problem considering this study aims to test theory and it is, therefore, expected that the relationships among the variables is generalisable and stable over time. The original random-sampled dataset consists of 171 responses, with their demographic distribution reported in Table 1. After data cleaning, the regression analysis was based on 158–160 responses and about 7–8% of the responses were dropped from the analysis due to missing values.

The proportion of survey respondents was relatively even for both policy domains with 56% of respondents from the public health domain and 44% from criminal justice. The majority of the survey respondents (82%) were involved in IIS initiatives across agencies, across levels of government, and across multiple levels of government with non-government organisations. Respondents indicated that state governments provided the majority of the funding (39%) for the IIS initiatives. Subsequently, the primary initiative coordinator for most of the IIS initiatives was from state government (61%),

followed by local government (25%). Not-for-profit organisations provided about 4% of the primary initiative coordination. The proportion of male respondents was higher than female respondents by 16%. The proportion of male respondents was higher in the criminal justice policy domain as compared to the public health domain. Almost all respondents had acquired at least one year of experience working in their respective field, with only 3% of the respondents indicating that they had acquired less than one year of work experience at the time of the survey.

**Table 1** Crosstab of sample distribution

<i>Categories</i>		<i>Types of policy domain</i>	
		<i>Public health (%)</i>	<i>Criminal justice (%)</i>
Primary initiative coord.	Federal government	8	5
	State government	65	56
	Local government	19	32
	Private entities	0	0
	Non-profit organisation	5	3
	Other (e.g., council of government)	3	4
Initiative's boundary	Across units	12	3
	Across agencies at the same level of govt	19	28
	Across levels of government	20	50
	Across one level of govt with non-govt org(s)	10	3
	Across multiple levels of govt with non-govt org(s)	34	17
	Other (e.g., multi-nationals)	5	0
Funding donor	Federal government	24	9
	State government	34	45
	Local government	15	36
	Private entities	4	1
	Non-governmental organisations	10	0
	No funding	11	5
	Other funding arrangements	2	4
Years of experience	0 years	2	4
	1–5 years	42	32
	6–15 years	38	47
	>16 years	18	17
Sex	Male	54	64
	Female	46	36
Average proportions of respondents		56	44

### 3.2 Variables and measurement

As mentioned before, we are interested in testing the influence of the determinants to two dependent variables, namely:



- CRRs
- the success of IIS.

All items in the questionnaire were rated on a seven-point Likert-type scale, ranging from 'Not at all' (1) to 'To a great extent' (7). A summary of the variables in the model is provided in Table 2 and the description and measurement of each variable are provided below.

*(1) Independent variables*

- Exercise of formal authority represents a negative measure for exercise of authority, measuring whether leaders and/or participants misused the power of their official positions.
- Collaboration and communication skills measure the extent to which communication within the IIS initiatives was effective.
- Diversity of participating organisation measures the extent to which the organisations participating in the initiative were diverse in terms of the level of government, mission, or resources.
- The use of boundary objects is a composite variable measuring the extent to which the participants were using certain boundary objects to facilitate communication and collaboration. Questions were asked about the value of (a) meeting minutes, planning documents and draft materials, (b) the use of prototypes and process descriptions, (c) the use of charters, and d) the use of stories (of personal experiences) in the initiatives. We ran Cronbach's alpha to test the reliability of the measurement of this variable and the result is 0.7790, which indicates reliability well above the threshold of 0.70.
- Respecting the autonomy of participating organisation is a composite variable to measure the extent to which the autonomy of organisations participating in the IIS initiatives was respected. The variable consists of three questions as follows: (a) there is no interference from other organisations, (b) the specific limitations of the organisation were respected by others, and (c) the specific needs of the organisation were respected by others. We run Cronbach's alpha to test the reliability of the measurement of this variable and the result is 0.8626, which indicates excellent reliability.
- Past experience is a composite variable that measures whether participants had previous positive experience working as a group. This is a composite variable consisting of two questions indicating the extent to which the participants had previous and positive previous experience working together. The Cronbach's alpha test for the reliability of the measurement of this variable is 0.8209, which also indicates excellent reliability.

*(2) Dependent variables*

There are two dependent variables in this study: (a) clarity of roles and responsibilities (CRRs) and (b) the success of IIS projects.

- a CRRs is a composite variable measuring the extent to which the roles and responsibilities of organisations participating in the IIS project were clear to the participants. This variable is a composite variable consisting of two sub-variables indicating the extent to which the respondent's organisation and the other participating organisation roles and responsibilities were clear to the respondent. The Cronbach's alpha test for the reliability of the measurement of this variable is 0.8149, which indicates excellent reliability.
- b Success of IIS. We adopt Eglene et al.'s (2007) argument and measure the success of IIS projects as follows:
- Overall success measures whether the IIS participants consider that, taken as a whole, the project was a success.
  - Met the policy objectives is measuring whether the participants agree that the project met its stated policy objectives and goals.
  - Technology success is a composite variable consisting of three constructs measuring technical success. The construct asks the participants whether they agree that the project is a technological success in terms of creating (a) information systems that can communicate with each other, (b) interoperable computer systems and networks, and (c) an integration of disparate databases into new data resources. The reliability of this variable measured by Cronbach's alpha is 0.8757.
  - Organisational success is a measurement of success in terms of the benefits that IIS brings to the organisation. We measure the benefits to organisations in five ways: (a) improvement in the day-by-day operations of government, (b) greater effectiveness of policy deliberation, (c) improved efficiency, (d) direct benefits to people, groups, and organisations, and (e) cost savings. This is also a reliable composite variable with Cronbach's alpha of 0.8589.

**Table 2** Means and Cronbach's alpha

<i>Variables</i>	$\mu$	<i>Std. dev.</i>	<i>ii-cor</i> <sup>1</sup>	$\alpha$
The use of boundary objects	0.004	1.5597	1.798	0.7798
Respecting the autonomy of participating org.	0.003	1.5437	1.408	0.8617
Previous experience	-0.007	1.3089	2.211	0.8199
Clarity of roles and responsibilities	0.012	1.2821	1.011	0.8070
Technological success	-0.007	1.5595	3.447	0.8770
Organisational success	-0.018	1.7992	1.555	0.8587
Exercise of authority	1.563	1.2157	1.563	—
Diversity of participating organisations	5.552	1.6281	5.552	—
Communication and collaboration skills	0.016	1.5956	0.016	—
Overall success	5.774	1.4371	5.774	—
Met stated policy objectives	5.716	1.4764	5.716	—

<sup>1</sup>ii-cor refers to an average of inter-item correlation for composite variables.

## 4 Results and findings

Based on an extensive review of the literature, we identify six determinants of CRRs. Furthermore, Pardo et al. (2009) also contend that CRRs significantly influence the attainment of success in an IIS project. This paper evaluates the extent to which the six determinants influence the development of CRRs and the attainment of success in an IIS project. We present our results and findings in three sub-sections as follows.

### 4.1 Testing the determinants of clarity of roles and responsibilities

Table 3 shows that three variables emerge as significant and positive predictors of CRRs. The results indicate that the use of boundary object is positively and statistically significant in influencing CRRs in an IIS project. Based on the magnitude of the coefficient, an increase of one standard deviation in the use of boundary objects will increase the creation of CRRs in IIS projects by 0.2335 of a standard deviation.<sup>1</sup>

**Table 3** Regression result for clarity of roles and responsibilities

<i>Variables</i>	<i>Coeff.</i>	<i>Beta</i>	<i>SE</i>
The use of boundary objects	0.1919	0.2263	0.0600**
Previous experiences working together	0.0525	0.0053	0.0688
Collaboration and communication skills	0.3270	0.3986	0.0822**
Diversity of participating organisation	0.1459	0.1812	0.0517**
Exercise of authority	-0.0684	-0.0626	0.0956
Respecting autonomy of participating organisations	0.0462	0.0556	0.0688
Constant	-0.7041		0.3362
<i>N</i>			159
<i>R</i> <sup>2</sup>			0.367
<i>F</i> (6152)			13.86

The collaboration and communication skills variable [colcom] was also found to be a significant predictor of CRRs in an IIS project. One standard deviation increase in the collaboration and communication skills will bring greater CRRs in IIS projects by 0.4069 of a standard deviation. The influence of diversity of participating organisations is positive and significant for developing CRRs in IIS projects. If diversity of organisations participating in the initiative increases by one standard deviation, the likelihood to foster CRRs among the participants increases by 0.1853 of a standard deviation. Comparing the three significant variables, the results in Table 3 (see beta column) indicate that collaboration and communication skills are the most dominant predictor with a beta value of 0.3986, followed by the use of boundary objects (0.2263), and then the diversity of participating organisations (0.1812). Based on the beta results in Table 3, the other three non-significant variables have beta coefficients with a low magnitude.

### 4.2 Measuring success in interagency information sharing (IIS) projects

There are various ways to define the success of a collaborative project from the perspectives of different project stakeholders (Eglene et al., 2007; Provan and Milward,

2001); the same holds true for IIS projects. For this reason, we measure the success of IIS projects from four aspects: overall success, policy success, technology success, and organisational success. The summary of the results is presented in Table 4.

**Table 4** Measurements of IIS project success

<i>Indicator of success</i>		<i>Degree of success</i>			
		<i>Not at all (%)</i>	<i>Not sure (%)</i>	<i>To certain degree (%)</i>	<i>To a great extent (%)</i>
The project was a success as a whole	Overall	5	2	25	69
The project met its stated policy	Policy	5	2	26	67
Information systems were created that can communicate with each other	Tech.	17	4	21	57
Interoperable systems and networks were successful		25	4	29	42
Integration of disparate database was successful		28	5	22	44
Improvement of govt. daily operation	Org.	13	6	23	58
Direct benefits to individual, group, and org		5	3	24	68
Greater effectiveness of policy deliberation		12	8	38	43
Improved efficiency		9	2	20	69
Cost savings		15	7	37	42

Our results in Table 4 indicate that the majority of respondents (93%) agree to a certain degree (25%) or to a great extent (69%) that, taken as a whole, the IIS project was a success. We found similar results when success is measured by the fact that the project met its stated policy goals, with 67% agreeing with that statement to a great extent and 26% agreeing to a certain degree. We found, however, different results for technological and organisational success. Overall, the indicators for technological and organisational success show that, on average, the respondents agree to a certain degree (24% technological; 29% organisational) or to a great extent (48% technological; 56% organisational) that the project was a success. In contrast, close to one-third of respondents do not agree or are not sure that the project enabled the creation of interoperable systems and networks and the creation of disparate databases into new data resources. Given that respondents perceived success differently, the next section discusses the extent to which the determinants of CRRs influence the different perceptions of the success of an IIS project.

#### 4.3 *Determinants of clarity of roles and responsibilities (CRRs) and success of IIS projects*

The regression results connecting the determinants of CRRs to the different measurement of IIS project success are presented in Table 5. The use of boundary objects consistently emerges as a significant predictor of IIS project success regardless of how success was measured. The use of boundary objects is statistically significant in influencing the success of IIS when success is measured by overall success, as organisational success, as technological success, and for meeting policy objectives. The results demonstrate, for

instance, that the overall success of an IIS project will increase by 0.246 of a standard deviation if the use of boundary objects increases by one standard deviation.

**Table 5** Regression results of IIS project success

<i>Variable</i>	<i>Overall success</i>	<i>Organisation success</i>	<i>Technology success</i>	<i>Met policy objectives</i>
The use of boundary objects	0.2276*** (0.0822)	0.2579*** (0.0949)	0.2319** (0.0893)	0.1634** (0.0826)
Previous experience	-0.0313 (0.0918)	0.2104 (0.1129)	0.0726 (0.1056)	-0.0792 (0.0963)
Communication and collaboration skills	0.1006 (0.1025)	0.1271 (0.1249)	0.1635 (0.1029)	0.1246 (0.1022)
Diversity of participating organisations	0.0636 (0.0755)	0.2076** (0.0933)	0.1734** (0.0822)	0.1036 (0.0828)
Exercise of formal authority	-0.2554 (0.1341)	-0.0606 (0.1332)	-0.1109 (0.0937)	-0.3654** (0.1501)
Respecting the autonomy of participating organisation	0.0247 (0.0849)	0.0838 (0.1015)	-0.1932** (0.0834)	-0.0010 (0.0870)
Constant	5.8428 (0.4886)	-1.0830 (0.6180)	-0.8453 (0.5315)	5.7198 (0.5299)
<i>N</i>	155	159	158	157
<i>F</i>	3.87	7.08	5.35	3.74
<i>R</i> <sup>2</sup>	0.14	0.18	0.12	0.15

\*significant at 0.1 level; \*\*significant at 0.05 level; \*\*\*significant at 0.01 level.

The results show four variables as significant predictors of IIS success depending upon the measurement of success (see Table 5). The results show that diversity of participating organisations is significant when IIS success is measured as organisational and technological success. The likelihood of achieving IIS success increases by 0.1878 of a standard deviation unit for organisational success and increases by 0.181 of a standard deviation unit for technological success when the participants understand that the organisations participating in the initiative were diverse in terms of the level of government, mission, or resources. The exercise of formal authority also emerges as a significant predictor when IIS success is measured as meeting the policy objectives. The exercise of formal authority is close to conventional threshold levels of statistical significance when success is measured for the overall project. The negative notation for the coefficient of the exercise of formal authority is a good sign because we measured the variable as a participant misusing formal authority. Thus, the negative value indicates that the likelihood to achieve policy and overall success decreases when participants misuse their formal authority in the IIS project. Finally, the results show that participant's perception that their organisation's autonomy was respected during the IIS project is statistically significant, but negatively influences the technological success of an IIS project.

The results also show that the way we measure IIS success influences the changes in the coefficient magnitude of the variables. For instance, the influence of the use of boundary objects is higher when the success of IIS projects was measured as an organisational success, such as improvements in the day-to-day operation of government. Nonetheless, the influence of the use of boundary objects is 11.7% lower, 10.1% lower, and 36.6% lower when success is measured as overall success, technological success, and meeting the policy objectives respectively. In another instance, the coefficient magnitude of the diversity of participating organisations is 19.7% higher when IIS project success is measured as organisational as compared to technological success. The changes in coefficient magnitude signify the different predictive power of the variable depending on the measurement of success. We further discuss our findings in the next section.

## **5 Discussion and concluding remarks**

This section discusses our main findings and contrasts them with previous studies. It also proposes some implications for research and practice and explains the limitations of this study. In this study, we ran two regression models testing how the six determinants of CRRs predict the development of CRRs and the likelihood of IIS project success. Our findings strongly support for the idea that facilitating coordination in multi-agency collaborative settings is important for an IIS project. In particular, our results demonstrate the significant roles of four variables for the development of CRRs and the likelihood of IIS project success: the use of boundary objects and communication skills, the diversity of participating organisations, respect for the autonomy of organisations in the project, and the exercise of formal authority. In the subsequent discussion, we integrate the four variables into two sections. This is because we argue that acknowledgement of the diversity of participating organisations, the exercise of formal authority, and respects for the autonomy of organisations in the project represent the strategy through which public managers could facilitate coordination in the IIS project.

### *5.1 The crucial roles of boundary object use in IIS projects*

IIS projects that involve multiple agencies necessitate collaboration where public officials must work across their respective agency boundaries (Dawes, 1996). This assertion positions boundary crossing as a crucial activity that could determine the success or failure of IIS projects (Pardo and Burke, 2008), especially since boundaries become more explicit due to the specialisation in bureaucracy (Hermans and Hermans-Konopka, 2010). Our findings demonstrate the strong influence of boundary objects on the need for and development of CRRs, as well as in affecting the success of IIS projects.

The findings suggest that the use of boundary objects in an IIS project influence the participants' need for and subsequent development of CRRs in the collaboration. The use of boundary objects helps to foster clarity and acceptance of shared norms among the organisations involved in the project, easing tensions and paving the way for progress (Thomson and Perry, 2006). Boundary objects are flexible and adapt to the needs and limitations of the participants, while simultaneously being robust enough for participants to develop a common identity (Star and Griesemer, 1989). We argue that participants leverage the unique characteristics of boundary objects to gauge the degree to which

CRRs are necessary to facilitate effective communication among the participants in an IIS project. The boundary object is important because the participants, or ‘people at the boundary’ (Akkerman and Bakker, 2011, p.139), often feel that they “sort of belong and sort of don’t” between those boundaries (Tanggaard, 2007, p.460) and need the flexibility to negotiate their position while at the same time maintaining their own organisation’s autonomy. In an effort to prevent conflict due to the ambiguity of their roles in the collaboration (Williams et al., 2007), the participants use boundary objects to negotiate their roles and reach a consensus on agreed upon CRRs based upon shared understandings (Carlile, 2002; Fox, 2011). Our findings thus support the assertion by Meyer and Mazerolle (2014) that the use of boundary objects provides clarity on the project’s goals, objectives, roles, and responsibilities.

The use of boundary objects can indirectly lead to the success of collaboration projects (Meyer and Mazerolle, 2014). Our findings demonstrate a strong connection between the use of boundary objects and the attainment of success in an IIS project. We also found that the magnitude of this connection differs depending on the participants’ perception and on how project success is measured. The influence of boundary objects is most dominant if the success of an IIS project is measured by the benefits that IIS bring to the organisation, such as improvement of day-to-day operations, improvements in efficiency, and costs savings. On the other hand, the use of boundary objects is a weaker prediction of success when it is measured as meeting the stated policy objectives and goals. These preliminary findings are intriguing considering that fewer studies evaluate a direct connection between boundary objects and success of IIS projects. As of now, our data is insufficient to postulate on the factors that drive the differences in magnitude among the four types of IIS success measurement, and that issue remains a topic for future research.

## *5.2 Facilitating coordination for IIS project success*

Our findings underpin the significant role of coordination in the success of an IIS project. Our results point to two determinants as significant and positive predictors of IIS success: the diversity of participating organisations and the exercise of formal authority. We posit that these two determinants play important roles in facilitating coordination in an IIS project, which then leads to the success of IIS. Studies argue that structural diversity positively and directly influences innovativeness (Aiken and Hage, 1968), increases the value of sharing (Cummings, 2004), and improves business performance (Jayne and Dipboye, 2004). Our findings show that the diversity of the participating organisations significantly influences both the emergence of CRRs as well as the IIS project success. We argue that the diversity of participating organisations serves as a wake-up call in IIS collaboration. The participants are motivated to accept the need for collaboration and coordination when they knew the organisations participating in the initiative were diverse in terms of their level of government, mission, or resources. As argued by Jonker and Nijhof (2006), information about the diversity of the participants is used to create mutual expectations about the cooperation needed in the early stage of collaboration.

Our findings also indicate that the judicious exercise of formal authority by the participants will ease tension among them, improve coordination, and contribute to the success of an IIS project. Of note, decreasing participant misuse of formal authority decreases the likelihood of a project’s failure and thereby increases the likelihood of

success (Sayogo et al., 2016). The exercise of formal authority is very crucial in an IIS project because it can create conflict given that the relative power and authority relationships of each government agency vary across the states and levels of government (Pardo et al., 2007). In interagency relationships with distributed authority, agencies are concerned with losing their agency identity, which make them less willing to accept the exercise of authority from others (Hoban, 1987). Formal authority in network settings develops gradually (Rethemeyer and Hatmaker, 2008), which can exacerbate the negative response to the exercise of formal authority in an IIS project. Our findings further indicate that the significant influence of the exercise of formal authority becomes more important when success is measured as overall success or meeting policy objectives and goals.

Finally, we found that participants' perception that their organisational autonomy was respected is significant and negatively influences the IIS project when success is measured as technological success. This finding is intriguing because losing autonomy and independence can be a major barrier to collaboration in interagency relationships (Hoban, 1987). We thus suggest that this finding stems from how success is measured in our survey. In the survey construct, one measurement of technological success is the ability to do the job without interference from others. It is plausible to argue that prior knowledge, computing ability, and expertise have a substantial influence on achieving technological success. Hence, interference in terms of knowledge exchange and expertise may support the progress of the project. As such, the need for knowledge exchange surpasses the need to for respect of organisational autonomy when it comes to advancements in collaborative technology.

### *5.3 Implications and future research*

Overall, we found that four out of the six determinants of CRRs have a statistically significant influence on the success of an IIS project, depending on the measurement of success. The main findings of this study have both research and practice implications.

#### *(a) Practical implications*

Our findings demonstrate that the use of boundary objects is important for the development of CRRs and then attaining success in an IIS project. However, the impact of boundary objects varies depending on the measurement of success. Consequently, government officials involved with IIS projects could use these results to manage the development and use of boundary objects. For instance, if success is measured in terms of technology development, such as: the implementation of the financial module in enterprise resource planning (ERP) system, the role of boundary objects is less important than if the project's success is measured through an organisational lens. Thus, participants or project managers could adjust their efforts accordingly and foster the use of diverse boundary objects as part of the process for clarifying roles and responsibilities.

The findings also indicate that the diversity of participating organisations was shown to have a significant and positive effect on an IIS project when success is measured as organisational and technological success. We argue that communication from public managers disclosing the number and diversity of the organisations participating in an IIS initiative could facilitate the initial participant acceptance of the need to collaborate and coordinate, which can then lead to success. The disclosure serves as a wake-up call to the participation in IIS collaboration of the crucial need to have well-coordinated efforts



given the diversity of the participants. On the other hand, our data is not sufficient to ascertain the relationship between the diversity of participating organisations and the number of conflicts that occur during the project. Thus, future research could focus on understanding the impact of diversity on potential conflicts and tension in IIS projects.

*(b) Theoretical implications and future research*

Based on a case study of child care services, Sloper (2004) suggests that goal alignment, leadership, systems and communication, and CRRs have great significance in multi-agency cooperation. Meyer and Mazerolle (2014) also point out that lack of clarity and understanding about capacity and boundaries have negative effects on interagency collaboration. As such, it can be argued that the impact of CRRs or its determinants to the success of an IIS project depends on other variables. We call for future research to re-evaluate the significance of CRRs and its determinants by considering the addition of other variables to the model, such as leadership, communication, and organisational capacity. Pardo et al. (2009) argue for sequential relationships between the determinants, the CRRs, and the success of an IIS project. In this paper, we tested them separately. We did not account for the mediating effect of CRRs on the relationship between the determinants of CRRs and the success of an IIS project. Future research could test the mediating effect of CRRs by using other statistical techniques such as structural equation modelling or partial least squares.

We argue that there are two plausible explanations as to why the impact of boundary object differs depending on the measurement of success. First, our measurement of the boundary object variable could cause these differences. In this study, we created a composite variable of three sub-variables to measure boundary object use. Future research could test the impact of boundary objects by using single indicator variables instead of a composite. Second, although we found the magnitude of the coefficient differs among the four measurements of success, we cannot ascertain whether the difference is significant. Future research could use differential statistics to test whether the influence of boundary objects indeed varies among the different measurement of success.

Studies focusing on private entities found that the effect of CRRs on the performance of a project is in fact mediated by other variables. For instance, Dickerson et al. (2012) found that CRRs affect effective communication and this in turn influences performance. As such, future research could ascertain whether the effect of CRRs is mediated by other variables in an IIS project. Finally, we found a negative influence of participants' perception that their organisation autonomy was respected during the IIS project on the technological success of IIS. In this study, we created a composite variable for technological success, which may have influenced its relationship with respect to organisational autonomy. Given that the sub-variables demonstrate similar associations with the outcome variable, the use of composite variables provide an increase in the power of the composite variable (Song et al., 2013). As the results indicate the convergence of the sub-variables in our study is very high (higher than the acceptable level of Cronbach's alpha). However, one could argue that using composite variables undermine the possible variability among the sub-variables. For that reason, future research could assess this finding by using single-indicator variables to represent technological success instead of creating a composite variable.

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## Note

- <sup>1</sup>Because the use of boundary objects is a composite variable, we have to interpret this variable in terms of an increase or decrease in standard deviation.